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**GE Energy**

## **Gas Turbine and Accessory Equipment Preservation**

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*These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes the matter should be referred to the GE Company.*

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## I. GENERAL

These instructions have been issued to recommend minimum protection and preservation for storage of heavy-duty gas turbines and their accessory equipment. Both short term and long term storage are described. Information for short-term storage relates to periods up to six months. Long term information refers to periods of storage in excess of six months. Storage period begins when equipment ships from the factory. All units going into storage should apply this GEK as soon as possible.

These instructions cannot anticipate all of the environmental conditions and other variables to which a customer may have to expose his equipment for one reason or another. It is essential, therefore, that reasonable judgment be used and additional protective measures taken where necessary and appropriate.

### NOTE

For shipment of materials direct from vendors, the vendors will provide required factory protection and include special site instructions with the shipment if notified that long term storage is required.

This information is furnished to serve as a guide in giving proper protection under a given situation. Protection of this kind of equipment can be complex and subject to so many variables that each owner should determine his plan of protection, and the contents of this document will not create any liability whatsoever on the part of the GE Company or its employees whether in warranty, alleged negligence or otherwise. The GE Company may be consulted for any special shipping or storage concerns applicable to a specific unit. In addition to information provided in this document refer to maintenance and System Description section of the Service Manual.

## II. GAS TURBINE

### A. Factory Preparation For Shipment of a Gas Turbine

This section describes the protective action, which has been performed in the GE Company factory prior to shipment.

1. All parts, removed from an assembly, are identified. Articles with moving parts or projecting parts that might become damaged by shock or vibration encountered in shipment are blocked, braced, or tied down. When practical, they are disassembled, and separately packaged.
2. Open base flanges are covered either with plywood covers with waterproof paper between the wood and metal, or blind flanges bolted to the flanges, or plastic flange covers. When plywood is used, it is at least 1 / 2 inch thick, and bonded with exterior (waterproof) glue. All other base openings are sealed with plugs or water-resistant tape. Exhaust and inlet areas are covered with corrugated plastic and / or reinforced fabric tarps.
3. The oil tank and associated base oil piping remain wetted after factory test; Shell Oil Company VSI-32 (or equivalent) oil having been used. For over seas units, fifty-five gallons of this same oil has been poured into the lube oil tank and twenty-five gallons poured into the turbine base oil channels as applicable prior to shipment. This oil has a vapor phase inhibitor to aid in protecting surfaces above the oil level and a rust inhibitor for covering wetted surfaces. F-Class machines will have fabricated reservoirs installed and filled with VSI 32 oil at the #1 and #2 bearing areas to aid in corrosion protection.

4. The interior of the machine has been protected with VCI treated paper. It contains a chemical which vaporizes and protects metal from corrosion. All openings are protected with covers.

### CAUTION

\*VCI paper must be removed prior to unit operation.

5. All exposed external surfaces shall be protected by one of the following: paint, VSI-32 (or equivalent) oil film, heavy preservative TECTYL 506 (or equivalent), or protective wrap.
6. Any vessel tested or operated with water is drained.
7. The inside surface of the disassembled lube oil and water piping, valves, etc., are fogged with VSI-32 (or equivalent) rust inhibitor oil to such extent that internal surfaces are wetted. Covers are used to seal the equipment and piping.
8. Enclosure access doors and panels are secured to the frames.
9. The gas turbine and accessory base are covered by a reinforced tarp.
10. VCI paper appropriate for electrical equipment and desiccant capsule are placed in all electrical junction boxes.

### NOTE

Assure that all parts are dry prior to storage.

#### B. Gas Turbine Short Term Storage

The gas turbine equipment barring extreme weather conditions is expected to remain protected from atmospheric corrosion for approximately six months with the factory preparation outlined above. Upon arrival of the unit at the customer's site and determination of the storage plans, the following recommendations should be taken into consideration. At arrival:

1. Inspect factory preparation measures especially in the turbine inlet, exhaust and combustion areas. If necessary, restore to factory preparation condition.
2. Check the lube oil tank and re-apply oil if necessary. Refer to "Factory Preparation," Item 3 preceding.
3. Check visible surfaces for rust. All rusty areas must be reported to the Power Answer Center.

### CAUTION

Do not paint in oil tank.

4. When accessory and turbine compartment space heaters are supplied, energize during storage period.

### C. Gas Turbine Long Term Storage

For the purpose of this document, long term storage is defined as being in excess of six months.

1. Before the unit is stored, the unit will be inspected (Ref Table 1 & 2), all deficiencies will be corrected and all findings will be reported through the Power Answer Center (PAC).
2. Provide closed loop air circulation through the machine whereby the circulated air is maintained at low humidity and above the dew point temperature. The airflow will circulate from the GT Inlet to the GT Exhaust. The air will be filtered, dehumidified and electrically heated (if required) (Ref Figure 1). If the dehumidifier system decreases the temperature of the circulated air, a heater must be provided to maintain the internal air temperature within 10 degrees of ambient. The relative humidity of the closed loop system must be kept lower than 30% at all times the unit is in storage. Each unit will have a dedicated dehumidifier. The flow rate will be in the range of 150-300 cfm. All VCI paper should be removed before operation of the closed loop system. It is essential that there are minimal leakages in the closed loop system. The tarp should be tightened around the unit, since the tarp is open at the bottom. The inlet and exhaust should be sealed in order to minimize the amount of outside air leakage. The quality of the dehumidified air will be sacrificed if leakages occur in the closed loop system.

The bearings will be preserved by VSI-32 oil. Upon the start of the storage term, the site will verify that VSI-32 is stocked in the bearing areas.

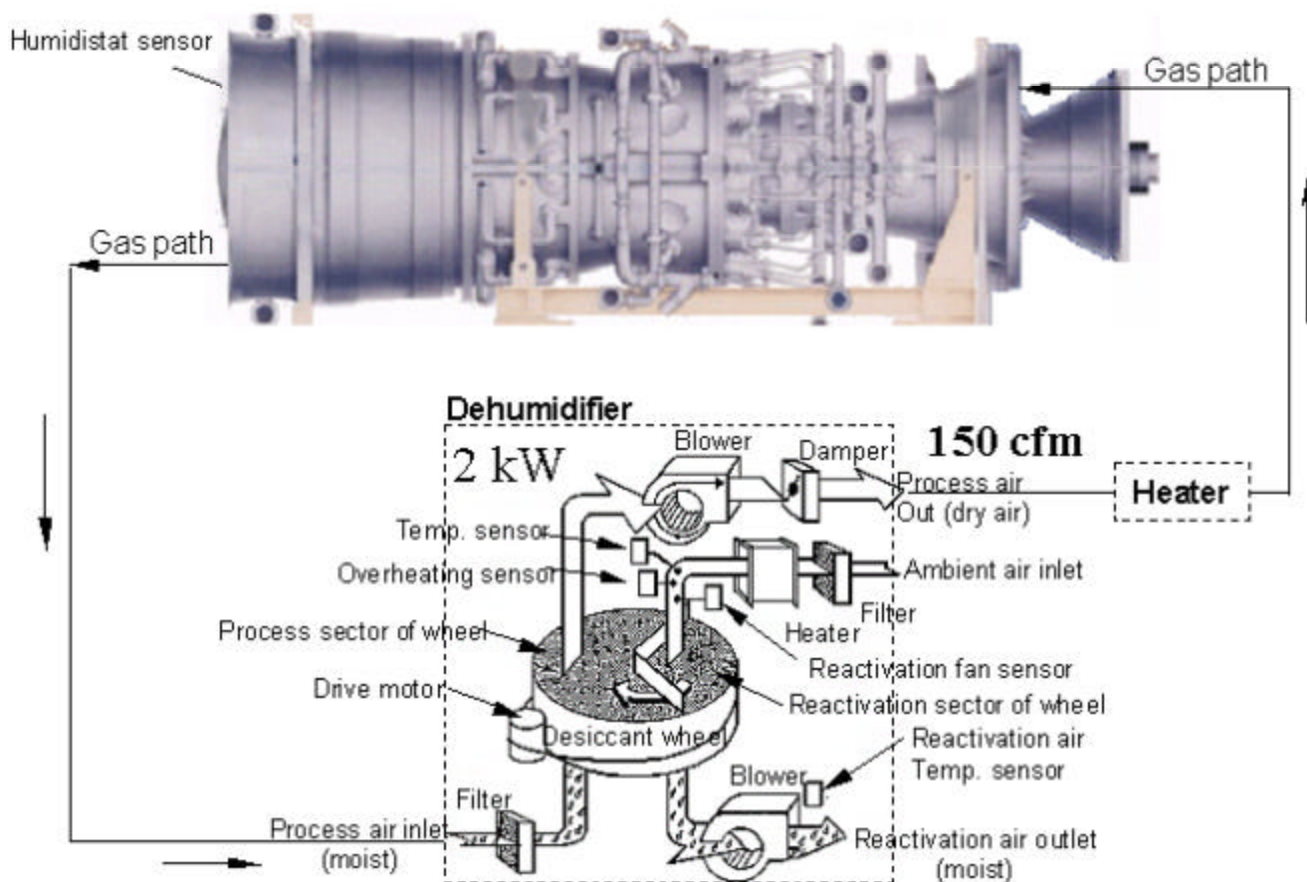


Figure 1. Closed Loop Humidity Control

3. The temperature and humidity of the air will be monitored and recorded at least twice a week as well as the condition of the air filters. Ripped or dirty air filters are to be replaced immediately. These procedures are covered in a formal documented inspection checklist (Ref Table 3) that will be completed twice a week.
4. Every year, the unit will be inspected, following a formal documented inspection checklist (Ref Table 4 & 5). This inspection will include outer surfaces as well as the boroscoping of the gas turbine internals. All functional and cosmetic rust must be reported through the Power Answer Center (PAC) immediately. Cosmetic rust is defined by any rust that does not affect the heat rate, output, life or serviceability of the Gas Turbine.

The bearings will be inspected with a boroscope through a pipe plug in the sealed drain line during the annual inspection. Any rust within the bearings will be reported through the Power Answer Center immediately. Once the inspection is complete, new VSI-32 oil will be added into each of the bearings.

If the tarp is damaged anytime during long-term storage, the recommendation is to replace with shrink tarp. Heat guns are also required to shrink the tarp heat gun, "Shrinkfast" - model #998, 200,000+ BTU's (Qty 2) or equivalent. In Addition to all of the above, you may need to purchase new rope, if the old rope cannot be reused, to tie down the bottom of tarp. This rope can be purchased from any local hardware store, making sure to replace with comparable rope. In lieu of the above shrink tarp, one can use the alternative Vinyl Coated Nylon tarp, drawing 255B9506P001. If the Gas Turbine is stored internally and the tarp is in working condition, the tarp can be repaired by sewing or taping any holes cut open to inspect. It is also acceptable, for indoor storage ONLY, to remove the shrink wrap until the unit is ready to be shipped to site. A list of drawing numbers for each frame size is included below in the Table.

**Table 1.**

<b>Tarp Drawing Numbers</b>		
MS-7EA		
	Turbine Unit Cover	332B7317P016
	Accessory Base Cover	332B7318P004
MS-7FA		
	Turbine Inlet Cover	357B1925P001
	Diffuser End Cover (2 Req'd)	116E2885P005
	Turbine Unit Cover	332B7318P002
MS-9FA		
	Turbine Inlet Cover	332B7338P002
	Turbine Unit Cover	332B7318P003

### **CAUTION**

Do not paint in oil tank.

5. When accessory and turbine compartment space heaters are supplied (E-class units), energize during storage period.
6. Upon the completion of the storage term, a full inspection of the unit will be completed and all findings must be reported through the Power Answer Center (PAC). Rust removal recommendations shall be obtained from an engineering disposition through the PAC. The factory prep to ship will be reapplied. The condition of the unit before shipment must be covered in a formal documented inspection checklist (Ref. Table 6 & 7).

#### **D. Preparation for Shipment for Rotor Only to be Stored Long Term**

1. Each operator is responsible for all dimensions he/she generates while performing this operation.
2. Maintain workstation in a neat and orderly manner.
3. Out-of-cycle fixtures, gages or masters cannot be used or kept at the workstation.
4. Always match the part number and serial number to the part number and serial number on the router. Re-mark if the marking is removed.
5. Refer any questions to your supervisor or engineer.
6. Record data per Q.C. Card and obtain Q.C. Verification as required.
7. With the rotor still in the balancing machine, clean the entire rotor with GE approved solvent (EG. NAPHTHA or equivalent). Remove rusty spots on the rotor surfaces, if any, using Scotchbrite. Use shop compressed air to dry all parts. Note: avoid handling parts with bare hands; salt and moisture from hands will promote corrosion.
8. Once the rotor is completely dry to the touch, tape to cover the following areas:
  - ?? Compressor wheel gaps with 2 layers of PVS tape.
  - ?? Tape to cover all cooling holes on bucket tip.
  - ?? Tape joint between turbine wheels and spacers.
  - ?? Tape counter bore of fwd stub shaft, turbine aft shaft and marriage joint where applicable.
9. Using a pressurized spray can apply a heavy coat of VCI-379 (or equivalent) corrosion preventive coating (5 parts water to 1 part of VCI-379) to the entire rotor, except buckets, journals, thrust collar and seals, until the entire rotor is wet on all surfaces. Note: Cover the floor to catch drippings. Keep the spraying pressure low to minimize chemical mist.
10. Allow VCI-379 (or equivalent) coating to dry in air for at least 60 minutes.
11. Wrapping of rotor:
  - a. Wrap compressor rotor blades with ocean or bubble wrap while slowly turning the rotor.
  - b. Use VCI stretch film to wrap around the rotor with 50% overlapping while slowly turning the rotor. Note : do not wrap the journals and onward until the end of the shaft.

- c. Place a pre-determined amount of VCI-609 powder (or equivalent) into enclosure while wrapping of VCI stretch film is in progress. The VCI-609 will slowly evaporate to cover inaccessible surface and extra protection on top on VCI-379 protective layer. Calculation of required VCI-609 powder: 130 GMS per m3 of space area
  - d. Wrap a second layer of normal stretch film to go over the layer of VCI stretch film.
  - e. Apply a thick coat of TECTYL 506 (or equivalent) on journals, thrust collar, seal surfaces and end coupling. Allow TECTYL coating to dry in air. Tape the Bentley burnished areas with PVC tape. Wrap journals and thrust face with layers of grease tape. Apply TECTYL 506 (or equivalent) on each layer of tape.
  - f. Wrap journals with rubber protective layer. Wrap normal film tightly on the journals and thrust collar including seal surfaces and end coupling.
  - g. Remove rotor from balancing machine. Remove the drive plate. Clean and spray TECTYL 506 (or equivalent) on the rotor end face and wrap with oil base grease tape and follow with layers of shrink-wrap film.
  - h. Move rotor on rotor stand for further instruction or load into shipping crate.
- 12. Inspect the shipping skid for any damage.
  - 13. Ensure that the inner face of the wooden walls is covered with a layer of plastic sheet. Replace plastic sheet if necessary.
  - 14. Lay vacuum bag in box. Use PP005/Pet-Alu-HDPE, grade MIL PRF 1 31 J Class 1.
  - 15. Calculate appropriate amount of desiccant for volume of bag. Insert into bag prior to sealing. Insert humidity indicator at a location that can be seen through viewing window in crate.
  - 16. Seal top of bag with hand held sealer. Leave aperture large enough for vacuum sealer. Vacuum seal.
  - 17. Pack rotor in the shipping skid and secure in place.
  - 18. Lay a layer of waterproof polyester sheet to cover the top half of entire rotor. Secure the polyester sheet to the rotor.
  - 19. Cover the top covers of shipping skid.
  - 20. Lay a layer of waterproof polyester sheet on top of the entire top cover to prevent water from entering the shipping skid. Ensure that the polyester sheet secured tightly on the crate.
  - 21. Cover any opening on the sidewall of the shipping skid.
  - 22. Rotor ready to ship.

#### **E. Instruction for Long Term Storage of Rotor Upon Receipt at Destination**

- 1. Inspect the shipping skid and shipping crate for any damage. (Ref Table 1&2 items as applicable)

2. If shipping crate is damaged, it must be replaced prior to long term storage.
3. Before rotor is stored, all deficiencies will be corrected and all findings reported through power answer center (PAC).
4. Rotor must be stored in an ambient temperature range not exceeding 22°F (-30°C) and 158°F (70 °C). Where ambients exceed this range, space heaters or air conditioners must be provided by the customer to keep the temperature within these specified limits. Relative humidity must be kept < 30%. Humidifier with flow rate of 150-300 CFM is required through container.
5. Humidity indicator to be checked and level to be recorded bi-weekly. Humidity levels > 30% on indicator to be reported through power answer center (PAC). The temperature and humidity of the air will be monitored and recorded at least twice a week as well as the condition of the air filters. Ripped or dirty air filters are to be replaced immediately. These procedures are covered in a formal documented inspection checklist (Ref Table 3 as applicable) that will be completed twice a week.
6. Upon the completion of the storage term, a full inspection of the rotor will be completed and all findings must be reported through the Power Answer Center (PAC). Rust removal recommendations shall be obtained from an engineering disposition through the PAC. The factory prep to ship will be reapplied. The condition of the unit before shipment must be covered in a formal documented inspection checklist (Ref. Table 6 & 7 as applicable).

### **III. CONTROL EQUIPMENT**

#### **A. Factory Preparation For Shipment**

This section describes the protective action which has been performed in the General Electric factory prior to shipment.

1. Domestic or Offshore Air Shipments
  - a. Unless otherwise specified, control equipment is shipped without additional covering over the normal painted steel enclosure.
  - b. All equipment doors are bolted in place.
  - c. All internal equipment lighting fixtures have bulbs taped in place.
  - d. Process instruments and similar rack mounted devices are packaged separately in a desiccant controlled atmosphere. These packages are then secured to the main control equipment.
  - e. All “pop-off” covers are secured with tape.
  - f. Glass (or plastic) covers on devices are covered with corrugated covering and marked with the international symbol for “Fragile.”
2. Offshore Ship Shipments
  - a. Panels and “indoor” Modular Electrical Control Centers (MECC) are protected as described in Item 1 above, except the equipment is export boxed.
  - b. Outdoor packages are protected as described in Item 1 above.

## B. Storage and Transportation

### 1. Temperature

Equipment (with the exception of batteries) must be stored or transported in an ambient temperature range not exceeding 22°F (-30 C) and 158°F (70 C). Where ambients exceed this range, space heaters or air conditioners must be provided by the customer to keep the temperature within these specified limits. See item 4 below for special battery storage requirements.

### 2. Humidity

Should the relative humidity be known to exceed 95%, it is recommended that the customer purchase a moisture vapor-proof, heat-sealed barrier bag which contains desiccant, and can have the air evacuated from it. The bag should be large enough so that it can be reused and resealed for all inspections performed in a period of three to six months.

To aid maintaining the integrity of the moisture vapor-proof pack, the following procedure should be followed in six months intervals after shipment.

- a. Open heat sealed bag at large seam
- b. Replace or dry out the desiccant
- c. Patch any holes or tears
- d. Close bag, evacuate air from bag, and reseal

### 3. Vibration and Shock

The control equipment must not be subjected to vibration or shock during transportation, exceeding the following:

#### Vibration

5-15 Hz at 0.0070 + 0.005 inch displacement

16-25 Hz at 0.060 + 0.035 inch displacement

26-33 Hz at 0.013 + 0.010 inch displacement

#### Shock

15g for 2 milliseconds

### 4. Batteries

Refer to Battery Vendor Publications in the gas turbine Service Manual for complete information. A copy of The Battery Instructions is included in the "Accessories Package" shipped with each battery. The battery charger cabinet should contain a copy of the battery charger instructions.

Read the Receiving section, the Storage section, and the Initial charge section: General Vendor's Instructions before accepting and/or handling the battery.

With 77°F or lower storage temperature, a lead-calcium battery must receive boost or initial charge within six months of the date the battery was manufactured. Higher than 77°F storage

temperature will accelerate internal self-discharge of a battery by a factor of two (and therefore decrease the time between manufacture and initial charge by a factor of  $1/2$ ) for each 15°F degrees above 77°F storage temperature.

#### IV. OFF BASE ACCESSORY MODULES

Accessory modules that ship to site directly from the manufacturer's facility are protected against corrosion in a similar manner to the equipment that ships from the GE Company. Specific requirements for accessory modules are as follows:

##### A. External Water Cooling Skid Module

###### 1. Factory Preparation For Shipment

These units are shipped from the factory with covers over all openings, plywood over the heat exchanger coils, and a heavy preservative film on the fan and motor shafts.

- a. Oil to air coils, as applicable, have an internal coating of Shell Oil Company VSI-32 oil.
- b. Water to air coils are admiralty and require no corrosion inhibitor.
- c. Heat exchanger tube bundle is dried, openings are sealed, then purged and pressurized with nitrogen.
- d. Pumping skid is sealed and preserved with either a glycol/water mixture or nitrogen as described above.
- e. Shipped loose piping and spool pieces are dried, fogged with water soluble oil and capped with shipping covers.
- f. The fan, pump and motor shafts are coated with a rust preventative compound.

###### 2. Short Term Storage

- a. Check all painted and galvanized surfaces for oxidation when the unit is put into storage. All oxidized areas must be cleaned and "touched up" immediately.
- b. Inspect fan, pump and motor shafts for adequate preservative and add a heavy film of Valvoline TECTYL 894 (or equivalent) as necessary.
- c. Check pressure of nitrogen in tube bundle and pump skid (if applicable) weekly. Recharge with nitrogen to 5 psig as required.
- d. Rotate fan, pump and motor shafts and verify proper lubrication of the bearings monthly.

###### 3. Long Term Storage

In addition to the short term storage recommendations,

- a. Check all painted surfaces for rust every six months after the unit is put into storage. All rusted areas must be cleaned and "touched up" (painted) immediately. If storage is outdoors, apply one coat of finish (enamel) paint to all primed surfaces. If storage is indoors, it is

recommended that the temperature be maintained between +50°F and +160°F, and relative humidity held below 35%.

- b. Inspect shafts for adequate preservative every twelve months and add a heavy film of Valvoline TECTYL 894 (or equivalent) as necessary.
- c. For oil to air units, add 5 gallons of Shell Oil Company VSI-32 (or equivalent) to each header when the unit is put into storage.
- d. For the water to air unit in lieu of section IV .A.3.c, above, apply a nitrogen purge to the coil section as follows:
  - 1) Assure coils are completely drained, by sloping if necessary.
  - 2) Blow warm (100°F minimum) air through the unit. The unit is sufficiently dry when a mirror held in the exhaust air stream does not fog.
  - 3) Seal the inlet and outlet nozzles with gasketed steel plates. The inlet plate has a tire valve installed in it, and the outlet plate a .5 inch or .75 inch NPT coupling.
  - 4) Admit nitrogen via the tire valve. When a match flame held at the outlet is extinguished (due to the nitrogen concentration of the exhaust air), plug the coupling.
  - 5) Continue to admit nitrogen until the internal pressure is 5 to 6 psig. Pressure may be checked with a tire gauge or pressure gauge if installed. Cap the tire valve.
  - 6) Check nozzle cover joints, tire valve, and outlet coupling plug for leakage.
  - 7) Check nitrogen pressure each week and refill if necessary.
- e. Uncouple the motors and energize them for at least one hour each month. An alternative is to remove the motors and store them in a controlled environment. For V-belt drive, remove the belts and sheaves and store in a controlled environment.
- f. Rotate the fans a few revolutions every month and assure that the bearings are packed with grease.
- g. Protect top of tube bundle, if exposed, from damage by covering with plywood.
- h. Protect pump skid, ship loose structural and piping spool pieces, instrumentation and other site installed items from corrosion and damage by waterproof packaging, storage in a climate controlled environment or other such means.

## **B. Off Base Atomizing Air Skid**

### **1. Factory Preparation For Shipment**

These units are shipped from the factory with covers over all openings, plywood over the heat exchangers, and doors secured.

- a. Oil to air coils have an internal coating of lube oil.
- b. Water to air coils are 304 stainless.
- c. All oil ports are full.

**2. Short Term Storage**

- a. Check all painted surfaces for rust when the unit is placed in storage. All rusted areas must be cleaned and “touched up” (painted) immediately.
- b. Inspect shafts for adequate preservative when the unit is placed in storage and add a heavy film of Valvoline TECTYL 894 (or equivalent) as necessary.

**3. Long Term Storage**

- a. Check all painted surfaces for rust every six months after the unit is placed in storage. All rusted areas must be cleaned and “touched up” (painted) immediately. If storage is outdoors, apply one coat of finish (enamel) paint to all primed surfaces. If storage is indoors, it is recommended that the temperature be maintained between +50°F and +160°F, and relative humidity held below 35%.
- b. Inspect shafts for adequate preservative every twelve months and add a heavy film of Valvoline TECTYL 894 (or equivalent) as necessary.
- c. For oil to air units, add 5 gallons of Shell Oil Company VSI-32 (or equivalent) to each header when the unit is placed in storage.
- d. For water to air units attach VCI paper to the coil nozzle (inlet and outlet pipe) covers. Check every six months.
- e. Uncouple the motors and energize them for at least one hour each month. An alternative is to remove the motors and store them in a controlled environment. For V-belt drive, remove the belts and sheaves and store in a controlled environment. For gear drive, rotate the gears a few revolutions each week, or store gear boxes in a controlled environment.
- f. Rotate the fans a few revolutions every month and assure that the bearings are packed with grease.

**C. Liquid Fuel Skids****1. Factory Preparation For Shipment**

Lagged skids are shipped with the doors secured. All openings are closed with VCI paper inserted. Un lagged skids are covered with a plywood enclosure and vapor barrier interior wall bolted to the base. Check every six months.

All Low Pressure pipes, heaters, pumps and filters have a residue of No. 2 diesel fuel.

All Filter vessels should have desiccant bags placed inside.

High pressure Liquid Fuel Pump shall be partially or completely filled with lube oil. Rotate pump manually once a month thereafter.

Liquid Fuel Flow Divider is partially filled with Vapor Space Inhibitive Oil and all external connections are capped. Rotate Flow Divider manually once a month thereafter.

## 2. Short Term Storage

Check all exposed painted surfaces for rust when the unit is placed in storage. All rusted areas must be cleaned and "touched up" (painted) immediately.

## 3. Long Term Storage

- a. Check all exposed painted surfaces for rust every six months. All rusted areas must be cleaned and "touched up" (painted) immediately. If storage is outdoors, apply one coat of finish (enamel) paint to all primed surfaces. If storage is indoors it is recommended that temperature be maintained between +50°F and +160°F and relative humidity held below 35%.
- b. For storage in high humidity and high salt content air environment it is recommended that the enclosure be opened and internal painted surfaces checked for rust every three months. All rusted areas must be cleaned and repainted immediately.
- c. When the enclosure is open energize motor heaters for 1 to 2 hours. An alternative is to remove the motors and pumps and store them in a controlled environment.
- d. At the first sign of rust on any nonpainted metal surface, replace the existing VCI paper with new paper.
- e. Isolate the Liquid Fuel Filters. Install suitable blanks/seals or caps on all external connections and partially fill Liquid Fuel System with Vapor Space Inhibitive Oil. Fill the system both upstream and downstream of the Liquid Fuel Bypass and Stop Valves. If a vent exists between the Stop and Bypass Valves, partially fill this space with Vapor Space Inhibitive Oil and close vent valve. Upon commissioning of the system, drain oil completely from all low-point drains. Flush entire system with No. 2 Diesel Fuel prior to making all final external connections.

## D. Fuel Gas Module (MLI 0991) and Fuel Gas Compartment (MLI A160) Preservation

### 1. Factory Preparation for Shipment

- a. Loose parts shall be clearly identified and braced to prevent movement during shipping. If any Strainers, valves or pipe spools are shipped loose, they shall be capped at both ends with a desiccant pouch attached to the inner surface of one of the blind flanges.
- b. Open flanges and pipes shall be sealed with metal shipping covers or blind flanges.
- c. Tube connections shall be sealed using a metal tube cap.
- d. Gas and air pipes shall be purged with nitrogen and a 5 psig blanket established.
- e. Ventilation louvers or dampers shall be internally covered with a sheet-metal panel.

- f. VCI paper or desiccant shall be placed inside all junction boxes, panels, and sealed containers.
- g. All enclosure doors and panels shall be securely latched for shipment. A steel shipping brace shall be installed across each door to prevent it from springing open during shipment.
- h. Sheet-metal covers shall be installed over all openings in the roof.

## **2. Short Term Storage**

- a. Inspect all primed, painted and galvanized surfaces for oxidation at monthly intervals. Clean and re-paint as necessary.
- b. Inspect pipe caps and flanges for tightness and damage. Replace as necessary. (Note: If a visible air gap exists between the pipe cover and the pipe, purge the gas piping with nitrogen and re-establish the seal.
- c. Lubricate and rotate fans monthly (if provided).
- d. Inspect the desiccant bags monthly to determine if they need replacement.
- e. Check the nitrogen pressure blanket monthly to make sure the pressure is above 5 PSIG.
- f. Doors shall be kept closed.

## **3. Long Term Storage**

- a. Perform Short Term storage checks at monthly intervals.
- b. Apply a finish coat to all factory primed surfaces.
- c. Replace either VCI paper or desiccant capsules at least once every six months. If humidity heaters are provided by GE (customer option) they shall be energized and run during the storage period using the thermostat provided with them to control their operation. If no humidity heaters are provided, then the customer may locate a temporary humidity heater inside each compartment and run it during the storage period to aid in the preservation of the equipment.

# **E. Water Injection Skid Preservation (as applicable)**

## **1. Factory Preparation for Shipment**

- a. Completely drain water from all skid piping, etc.
- b. Thoroughly flush system with 1:1 Propylene Glycol/Demineralized Water Solution. Ensure that flowmeter(s), filter housing, pump casing and all low points are completely flushed with this solution. Completely drain as much of this solution as possible from the system.
- c. Install steel shipping covers on all flanged openings. Install threaded plugs in all threaded openings.

- d. Apply film of suitable corrosion preventative compound to exposed pump/gearbox/motor drive shafts.
  - e. Remove vertical pump motors and package separately for shipment in accordance with motor manufacturer's instructions.
  - f. VCI paper and desiccant capsules placed in all electrical enclosures and junction boxes.
  - g. Remove inlet/outlet ventilation hoods and secure them inside the skid enclosure for shipment.
  - h. Final check and touch-up of all painted surfaces immediately prior to shipment of skid.
  - i. Seal all openings, install shipping channels to secure all doors closed.
2. Short Term Storage
- a. Energize compartment space heaters if provided. If pump motors are installed, energize motor space heaters if provided.
  - b. Re-inspect painted surfaces and touch-up as necessary.
  - c. Reapply corrosion preventative to shafts as necessary, recheck at two monthly intervals.
  - d. Fill water injection pump gearbox to normal level with specified oil. Manually rotate pump/motor/gearbox at least five revolutions, check bearing lubrication, repeat at intervals of six weeks.
  - e. Operate the cooling fan for approximately one minute at intervals of six weeks.
3. Long Term Storage
- In addition to the Short Term storage procedures:
- a. If the skid is stored outdoors, all factory primed surfaces must be finish painted.
  - b. Check and repaint as necessary.
  - c. Replace VCI paper and desiccant capsules at proper intervals.
  - d. If skid has been operated before storage, isolate skid from water supply and completely drain all components and piping (open filter and pump casing drains, strainer blowdown drains, piping lowpoint drains, etc.)

## **V. LOAD GEAR**

### **A. Factory Preparation For Shipment**

After assembly is complete, the gear is closed up so that the unit is reasonably airtight. The casing is closed up except for a minimum access hole. Five gallons of warm (greater than 80°F) VSI #32 oil is poured into the casing and one quart of warm (greater than 80°F) mist of VSI #32 oil is sprayed through the minimum access hole. The access hole is sealed immediately after spraying.

**B. Storage**

Upon receipt and every four months thereafter :

?? Inspect the load gear for openings to the air.

?? Spray the load gear interior with a mist using one quart of warm (greater than 80°F) VSI #32 oil or equivalent.

?? Seal any openings to the air and access holes immediately after spraying.

If the inspection cover is opened during storage; then after casing has been closed up (except for minimum access hole), repeat steps 2 and 3, above.

1. VSI #32 Oil is a product of Shell Oil Company.
2. Regarding oils equivalent to VSI #32, rust resistance tests have been conducted using VSI #32 oil only.
3. Application (spraying) of oil may be accomplished with Sure Shot Sprayer Model A with 302C Nozzle (extra fine). Sure Shot Sprayer is a product of Milwaukee Sprayer Company, Inc., 5635 West Douglas Avenue, Milwaukee, Wisconsin 53218, toll free phone number: 1-800-558-7035. This sprayer also comes with CO<sub>2</sub> Adapter No. 450 which makes it portable for field use. Three CO<sub>2</sub> cartridges are required to spray one quart of oil.

**E Class Pre-Storage****SERIAL NUMBER****NOTE: Any discrepancies found during this check must be reported immediately through the PAC****Check All Units For:****Checked by: (initials)****Comments**

General condition of unit (Trash, debris, dents, rust, graffiti, etc)

General condition of Traps (Rips, holes, etc)

If unit is to be stored outdoors, add weather proof tarp

Chafing of lines hoses &amp; pipes

All masking removed

Paint missing or scratched

Coupling shafts, valve stems wrapped with cosmoline paper

No Paint On:

CO2 Nozzles

Heaters

Fine Detectors

Grease Fittings

Valve Stems (Protected with TECTYL)

LVDTs on IGV Actuator

IGV Actuator Ram (Protected with TECTYL)

Gas Detector Sensing Ports

Extraction Valve Bleed Ports

Purge Valve Bleed Ports

Device Labels

Door Gaskets

Sightglasses

False Start Drain Valve Stems &amp; Bleed Ports

Gas detectors sensing ports covered with plastic bags (paint bags yellow)

VCI Paper and Desiccant Capsule in junction boxes

Drains on junction boxes open

Door backing plates welded, painted (lagged units only)

Door Chains installed (lathed doors only)

Sharp edges on sheet metal

Inlet and Outlet sealed by protective cover (Trap, Plastic, etc.)

**Check Turbine Compartments for:**

Support leg shims attached to until

Nut &amp; bolt under IGV

Oil in Bearing Area

**Performed By:** \_\_\_\_\_ **Date:** \_\_\_\_\_**Table 1**

**F Class Pre-Storage****SERIAL NUMBER**

**Note: Any discrepancies found during this check must be reported immediately through the PAC**

<u>Check All Units For:</u>	<u>Checked by:</u> <u>(initials)</u>	<u>Comments</u>
General condition of unit (Trash, debris, dents, rust, graffiti, etc)	<input type="text"/>	<input type="text"/>
General condition of Traps (Rips, holes, etc)	<input type="text"/>	<input type="text"/>
If unit is to be stored outdoors, add weather proof tarp	<input type="text"/>	<input type="text"/>
All open ended piping is property sealed	<input type="text"/>	<input type="text"/>
All masking removed	<input type="text"/>	<input type="text"/>
Paint missing or scratched	<input type="text"/>	<input type="text"/>
No Paint On:		
Grease Fittings	<input type="text"/>	<input type="text"/>
Device Labels	<input type="text"/>	<input type="text"/>
IGV Actuator Ram (Protected with TECTYL)	<input type="text"/>	<input type="text"/>
VCI Paper and Desiccant Capsule in junction boxes	<input type="text"/>	<input type="text"/>
Sharp edges on sheet metal	<input type="text"/>	<input type="text"/>
Inlet and Outlet sealed by protective cover (Trap, Plastic, etc.)	<input type="text"/>	<input type="text"/>
Plastic covers on all open pipe	<input type="text"/>	<input type="text"/>
<u>Check Turbine Compartments for:</u>		
Oil in Bearing Area	<input type="text"/>	<input type="text"/>

**Performed By:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Table 2**

## BI-weekly Storage Inspection

### SERIAL NUMBER

**Note: Any discrepancies found during this check must be reported immediately through the PAC**

Complete the following:

Date Inspected	/   /
Beginning Storage Date	/   /
Closed Loop Humidity @ Turbine Outlet	%
Closed Loop Temperature @ Turbine Outlet	F
Condition of Air Filters	Good / Poor
Humidity of Building	%
Ambient Air Temperature of Building	F
Unit Wrap Intact	
Visual Inspection of Closed Loop Circulation System:	

Comments:

**Performed By:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Table 3**

## E Class 1 Year Storage Inspection

### SERIAL NUMBER

**Note: Any discrepancies found during this check must be reported immediately through the PAC**

**Check All Units For:**

**Checked by: (initials)**

**Comments**

General condition of unit (Trash, debris, dents, rust, graffiti, etc)



General condition of Traps (Rips, holes, etc)



If unit is to be stored outdoors, add weather proof tarp



Chafing of lines hoses & pipes



All masking removed



Paint missing or scratched



Coupling shafts, valve stems wrapped with cosmoline paper



No Paint On:

CO2 Nozzles



Heaters



Fine Detectors



Grease Fittings



Valve Stems



LVDTS on IGV Actuator



IGV Actuator Ram



Gas Detector Sensing Ports



Extraction Valve Bleed Ports



Purge Valve Bleed Ports



Device Labels



Door Gaskets



Sightglasses



False Start Drain Valve Stems & Bleed Ports



Gas detectors sensing ports covered with plastic bags (paint bags yellow)



VCI Paper and Desiccant Capsule in junction boxes



Drains on junction boxes open



Door backing plates welded, painted (lagged units only)



Door Chains installed (lathed doors only)



Sharp edges on sheet metal



Inlet and Outlet sealed by protective cover (Trap, Plastic, etc.)



**Inspection:**

Boroscope various compressor, turbine & combustion components



Visual on all external piping and casing



Visual on bearing tunnel



Dehumidifier Maintenance



Full Evaluation of Closed Loop System



Replenish Oil in Bearing Area



**Performed By:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Table 4**

## F Class Year Storage Inspection

### SERIAL NUMBER

**Note: Any discrepancies found during this check must be reported immediately through the PAC**

#### Check All Units For:

#### Checked by: (initials)

#### Comments

General condition of unit (Trash, debris, dents, rust, graffiti, etc)



General condition of Traps (Rips, holes, etc)



All open ended piping is properly sealed



All masking removed



Paint missing or scratched



No Paint On:

Grease Fittings



Device Labels



IGV Actuator Ram (Protected with TECTYL)



VCI Paper and Desiccant Capsule in junction boxes



Sharp edges on sheet metal



Inlet and Outlet sealed by protective cover (Trap, Plastic, etc.)



Plastic covers on all open pipe



#### Inspection:

Boroscope various compressor, turbine & combustion components



Visual on all external piping and casing



Visual on bearing tunnel



Dehumidifier Maintenance



Replenish Oil Bearing Area



Full Evaluation of Closed Loop System



**Performed By:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Table 5**

## E Class Final Visual

## SERIAL NUMBER

**Note: Any discrepancies found during this check must be reported immediately through the PAC**

Check All Units For:Checked by: (initials)Comments

General condition of unit (Trash, debris, dents, rust, graffiti, etc)

General condition of Traps (Rips, holes, etc)

If unit is to be stored outdoors, add weather proof tarp

Chafing of lines hoses &amp; pipes

All masking removed

Paint missing or scratched

Coupling shafts, valve stems wrapped with cosmoline paper

No Paint On:

CO2 Nozzles

Heaters

Fine Detectors

Grease Fittings

Valve Stems (Protected with TECTYL)

LVDTs on IGV Actuator

IGV Actuator Ram (Protected with TECTYL)

Gas Detector Sensing Ports

Extraction Valve Bleed Ports

Purge Valve Bleed Ports

Device Labels

Door Gaskets

Sightglasses

False Start Drain Valve Stems &amp; Bleed Ports

Gas detectors sensing ports covered with plastic bags (paint bags yellow)

VCI Paper and Desiccant Capsule in junction boxes

Drains on junction boxes open

Door backing plates welded, painted (lagged units only)

Door Chains installed (lathed doors only)

Sharp edges on sheet metal

Proper removal of circulation system with all opens sealed

Re-install VCI paper

Check rail car and its blocking

Check Turbine Compartments for:

Support leg shims attached to until

Nut &amp; bolt under IGV

Replenish Oil in Bearing Area

Performed By: \_\_\_\_\_

Date: \_\_\_\_\_

Table 6

## F Class Final Visuals

### SERIAL NUMBER

**Note: Any discrepancies found during this check must be reported immediately through the PAC**

<u>Check All Units For:</u>	<u>Checked by:</u> <u>(initials)</u>	<u>Comments</u>
General condition of unit (Trash, debris, dents, rust, graffiti, etc)	<input type="text"/>	<input type="text"/>
General condition of Traps (Rips, holes, etc)	<input type="text"/>	<input type="text"/>
Chafing of lines hoses & pipes	<input type="text"/>	<input type="text"/>
All masking removed	<input type="text"/>	<input type="text"/>
Paint missing or scratched	<input type="text"/>	<input type="text"/>
No Paint On:		
Grease Fittings	<input type="text"/>	<input type="text"/>
Device Labels	<input type="text"/>	<input type="text"/>
IGV Actuator Ram	<input type="text"/>	<input type="text"/>
VCI Paper and Desiccant Capsule in junction boxes	<input type="text"/>	<input type="text"/>
Sharp edges on sheet metal	<input type="text"/>	<input type="text"/>
Proper removal of circulation system with all opens sealed	<input type="text"/>	<input type="text"/>
Plastic covers on all open pipe	<input type="text"/>	<input type="text"/>
Check rail car and its blocking	<input type="text"/>	<input type="text"/>
Replenish Oil in Bearing Area	<input type="text"/>	<input type="text"/>
<u>Check Turbine Compartments for:</u>		

**Performed By:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Table 7**